BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

1,151,246

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,151,246

Date of filing Complete Specification: 24 Oct., 1967.

Application Date: 14 Nov., 1966. No. 50837/66.

Complete Specification Published: 7 May, 1969.

Index at acceptance:—B8 A (3D, 3E, 3K)

Int. Cl.:—B 65 g 3/10

COMPLETE SPECIFICATION

Improvements in or relating to Pneumatic Material Handling Systems

I, WILLIAM JOHN COURTNEY TRYTHALL, a British subject of 6, Oakville Mansions, Devonshire Road, Southampton, Hampshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to material handling systems of the kind in which a fluid, or powdered or granular wet or dry material is to be conveyed by compressed air along a pipeline to a receiving point such as, for example, a processing plant for the material.

In such systems, the material is initially fed from a hopper into a material-supply vessel that can be subsequently sealed from the hopper and, thereafter, compressed air is passed into the supply vessel to cause the material to be discharged into the aforesaid pipe-line.

In such systems a supply of compressed air must be readily available for each supply vessel, and such a supply must be capable of delivering large quantities of compressed air in a short space of time sufficient to cause the contents of the supply vessel to be effectively passed along its pipe line. Where a plurality of such systems are in use, the compressed air bottles or tanks that are used to store the compressed air occupy a considerable amount of floor space and entail the supply and installation of long lengths of piping interconnecting said bottles or tanks with said supply vessel, said piping being of sufficient diameter to ensure that the compressed air can be delivered to the supply vessels at the required rate.

An object of the present invention is to provide a supply vessel of the kind stated which incorporates its own compressed air reservoir and thus eliminates the necessity for the separate installation of suitable air reservoirs for the supply vessel.

According to the present invention there is provided a material handling system comprising a material supply vessel having a closable inlet opening through which it can be filled with material and a discharge pipe through which said material can be discharged by means of compressed air when the closable opening is closed, the compressed air being stored in a reservoir extending around the material supply vessel, the reservoir communication with the interior of the material supply vessel by suitable ducting and valve means, the discharge pipe extending from the material supply vessel through the side of the reservoir.

Preferably the material-supply vessel is of conical formation, or a vertical cylindrical vessel with a lower part of conical formation, the sides of the conical formation being at an angle that is steeper than the angle of repose of the material being handled.

In a preferred form the compressed air reservoir uses the material supply vessel as part of the wall surface of the compressed air reservoir. Thus, for example, the compressed air reservoir may be cylindrical, the upper end of the conical formation nesting within the cylinder and being secured therein in an air tight manner at its upper end, for example by welding.

The advantage of a material-supply vessel constructed according to the present invention, is that the compressed air reservoir can be built to meet the exact volumetric and pressure requirements called for to expel the contents of the material supply vessel since the size of the material-supply vessel and the nature of the material to be handled thereby can be ascertained prior to construction.

A further advantage is that with the material supply vessel and the compressed air reservoir constructed as an integral unit it is a simple matter to interconnect the two with means whereby the compressed air can be passed into the material supply vessel at the

desired rate, the previously referred and separately installed runs of piping used for this purpose being avoided.

Further, it has been found that there is a considerable saving of floor space when a unit constructed according to the present invention is compared with an equivalent size material supply vessel having a separate air pressure source located at ground level.

A further advantage is that each material supply vessel constructed according to the present invention need only have a single and relatively small diameter pressure supply pipe connected to the compressed air reservoir extending therearound, since whilst the material supply vessel is being re-charged with material the air reservoir can be re-charging via said supply pipe by means of an air compressor.

An embodiment of the present invention will now be described with reference to the accompanying drawings, in which :—

Figure 1 is a cross-section through a material supply vessel according to the present invention, and

Figure 2 is a part section showing a modified air feed arrangement.

Referring firstly to figure 1 there is shown a cylindrical vessel 1 having domed upper and lower ends 2 and 3. Located within the cylindrical vessel 1 is a frusto-conical hopper 4, the external diameter at its upper end being equal to the internal diameter of the cylindrical vessel 1. The upper end of the hopper 4 is welded to the internal surface of the cylindrical vessel 1.

The domed upper end 2 is formed with, or has secured thereto, a flanged inlet aperture 5 through which material to be conveyed is fed into the hopper 4.

At its lower end the hopper 4 is coupled to a discharge pipe 6 via a discharge pipe bend 6*a* whereby material can be discharged from the hopper as and when required. The discharge pipe 6 extends through the cylindrical wall of the vessel 1.

The space 7 formed between the outer surface of the hopper 4 and the internal surface of the cylindrical vessel 1 is used as a compressed air reservoir and for this purpose it is fitted with an air inlet connection 8. The volume of the space 7 is so proportioned that the correct amount of compressed air can be stored therein to effect a complete discharge of the material in the hopper 4 when such air is conveyed to the upper surface of the material in the hopper 4.

A pipe 9 interconnects the space 7 with the upper domed end 2. The pipe 9 is connected at its lower end to a connection 12 in the wall of the vessel 1 and at its upper end the pipe 9 is connected to a blowing valve 13 connected to an air inlet connection 14 in the domed end 2.

Extending downwardly from the air inlet connection 14 is a pipe 15 connected at its lower end to a channel section ring 16. The channel section ring 16 is connected at its upper edge to the internal surface of the upper domed end 2 and its lower edge is slightly spaced from the internal surface of the upper domed end 2. This spacing may be such as to provide a gap of the order of 0.02 inches to 0.027 inches between the lower external circumference of the channel section ring 16 and the internal circumference of the domed end to which the ring is secured.

At the lower end of the cylindrical vessel 1 is a drain pipe 17, which extends through the cylindrical vessel 1 and terminates at its lower end at a point spaced slightly above the inner lower surface of the domed end 3 so that any liquid that may inadvertently collect within the cylindrical vessel 1 can be forced out through the drain pipe 17 by utilising air pressure within the vessel 1.

The cylindrical vessel 1 is supported on a chassis 18 in any suitable manner and an inspection cover 19 is provided enabling access to be gained to the inside of the vessel 1. In operation the valve 13 and the pipe 17 will be closed whilst air pressure is supplied to the cylindrical vessel 1 via the air inlet connection 8. Whilst the space 7 is thus being charged with compressed air, the discharge pipe 6 will be closed by a valve (not shown) and a supply valve (not shown) coupled with flanged opening 5 will be opened to permit material to fall into the hopper 4. When sufficient material has been supplied to the hopper 4 the valve coupled to the flanged opening 5 will be closed.

When the space 7 has been sufficiently charged with compressed air the valve coupled to the discharge pipe 6 will be opened and thereafter the valve 13 will be opened. As a result the compressed air within the space 7 is discharged via the pipe 9, valve 13 and pipe 15 to the channel-section ring 16. The compressed air within the channel-section ring 16 is discharged through the small gap between the lower edge of the ring 16 and the internal surface of the upper domed end 2.

The air that is discharged in this manner acts on the material within the hopper to discharge it via the bend 6*a* and pipe 6, it being noted that the manner in which the air is discharged from the channel section ring 16 is such as to scour the internal surface of the hopper 4 to ensure that all of the material therein is effectively discharged from the hopper 4.

Figure 2 shows a modification in which the channel-section ring 16 is replaced by a plain ring 20 which is secured at its upper edge to the domed end 2 and extends towards the hopper 4 to leave a small annular gap between its lower end and the inner surface of the hopper 4. With this arrangement a proportion of

the air supplied through the small annular gap tends to flow along the inner surface of the hopper 4.

In a further modification not shown the channel section ring 16 and plain ring 20 may be replaced by, or supplemented by, one or more discharge jets acting on the upper surface of the material in the hopper 4.

The valve 13 can be replaced by any other suitable form of valve. The pipe 9 and its associated components may be contained within the vessel 1 if so desired.

The manner in which the discharge pipe 6 is coupled to the hopper may be by any suitable connection.

The pipe 9, connection 12, valve 13, connection 14 and pipe 15 may be duplicated on the opposite side of the vessel 1 so that compressed air can be supplied to diametrically opposite points of the rings 16 or 20.

The means for closing the discharge pipe 6 may be an air operated blade-valve slidable across the opening at the lower end of the frusto-conical hopper 4, there being suitable pipe means extending from the valve to a suitable connection in the cylindrical vessel 1.

In a similar manner the valve means that is used to shut off the flanged opening 5 may also be an air-operated blade valve arrangement.

The discharge pipe 6 may be connected externally of the vessel 1 to a curved pipe coupled through rotatable means to the pipe 6. By this means the direction of discharge of the material, once it has passed through the wall of the vessel 1 may be varied.

The upper domed end 2 may, if desired, be replaced by a flat upper surface.

The cylindrical vessel 1 may be associated with weighing means whereby the amount of material fed into the hopper 4 can be determined, that is to say the valve closure means for the flanged opening 5 may be shut on the contents of the hopper 4 reaching a predetermined weight. For this purpose the vessel 1 may be pivotally mounted at one side, for example, at the side through which the discharge pipe 6 extends, and on its diametrically opposite side there may be a load-cell operated by support means resting on the chassis 18.

WHAT I CLAIM IS:—

1. A material handling system comprising a material supply vessel having a closable inlet opening through which it can be filled with material and a discharge pipe through which said material can be discharged by means of compressed air when the closable opening is closed, the compressed air being stored in a reservoir extending around the material supply vessel, the reservoir communicating with the interior of the material supply vessel by suitable ducting and valve means, the discharge pipe extending from the material supply vessel through the side of the reservoir.

2. A material handling system as claimed in claim 1 in which the material supply vessel is of frusto-conical configuration, the sides of the vessel being at an angle steeper than the angle of repose of the material being handled.

3. A material handling system as claimed in claim 1 or claim 2 in which the material-supply vessel forms part of the wall surface of the compressed air reservoir.

4. A material handling system as claimed in any preceding claim in which the discharge pipe is connected to the material supply vessel through an elbow connection.

A material handling system as claimed in any preceding claim in which the compressed air from the reservoir is discharged into the material supply vessel through an annular gap formed between a ring secured to the material supply vessel and the inner surface of the wall of said vessel.

6. A material handling system as claimed in claim 5 in which the ring is of channel-section with the interior of the channel directed towards the innner surface of said wall, the upper limb of the channel being longer than the lower limb.

7. A material handling system as claimed in claim 5 when dependent upon claim 2 in which the ring is plain and extends towards the frusto-conical wall of the material supply vessel.

8. A material handling system as claimed in any one of claims 5 to 7 in which a pipe extends from the ring to a control valve which receives compressed air from the reservoir.

9. A material handling system as claimed in any one of claims 5 to 8 including one or more compressed air discharge jets adapted to discharge compressed air on the upper surface of the material in the material supply vessel.

10. A material handling system as claimed in any preceding claim in which the ducting and valve means for the compressed air are located within the air reservoir.

11. A material handling system as claimed in any preceding claim in which the ducting and valve means for the compressed air are duplicated and disposed to supply air at diametrically opposed locations.

12. A material handling system as claimed in any preceding claim in which the discharge of material is controlled by vlave means.

13. A material handling system as claimed in claim 12 in which the valve means comprises a pneumatically operated blade valve slidable across the outlet opening of the material supply vessel.

14. A material handling system as claimed in any preceding claim in which the closable inlet opening of the material supply vessel is controlled by a pneumatically operated blade valve.

15. A material handling system as claimed in any preceding claim in which the discharge pipe externally of the reservoir is curved and rotatable so as to vary the direction of dis-

charge of the material once it has passed through the wall of the reservoir.

16. A material handling system as claimed in any preceding claim associated with weighing means adapted to weigh the amount of material fed into the material supply vessel, said weighing means being adapted to operate valve means for closing said inlet opening upon the contents of the vessel reaching a predetermined weight.

17. A material handling system as claimed in claim 16 in which the reservoir is pivotally mounted on one side and is provided on its side diametrically opposite said pivot mounting with a load-cell.

18. A material handling system substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

For the Applicant,
HUGHES & YOUNG,
7, Stone Buildings,
Lincoln's Inn,
London, W.C.2.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

1151246 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

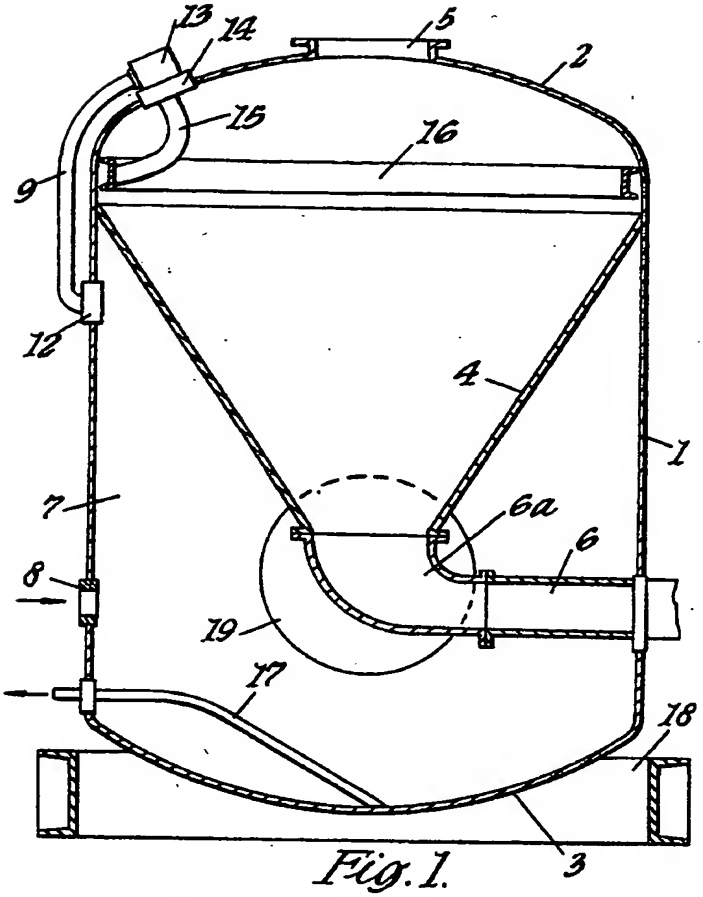

Fig. 1.

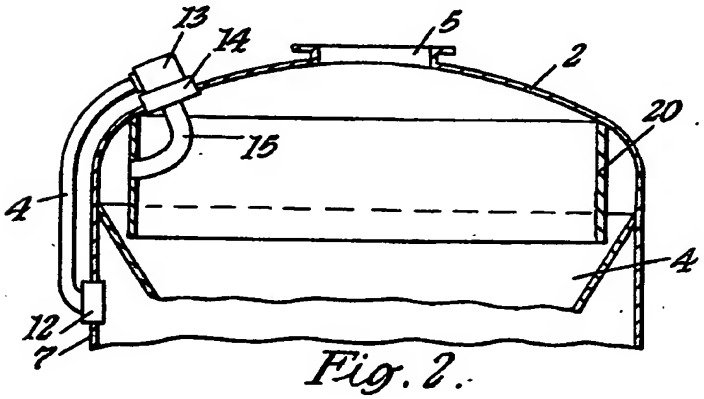

Fig. 2.